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Research Branch  
Technical Bulletin 1993-16E

# Guide to the Wild Germplasm of Brassica and Allied Crops

## Part III

Centre for Land  
and Biological Resources Research



Centre de recherches sur les  
terres et les ressources biologiques

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### **Cover illustration**

The images represent the Research Branch's objective: to improve the long-term competitiveness of the Canadian agri-food sector through the development and transfer of new technologies.

*Designed by Research Program Service.*

### **Illustration de la couverture**

Les dessins illustrent l'objectif de la Direction générale de la recherche : améliorer la compétitivité à long terme du secteur agro-alimentaire canadien grâce à la mise au point et au transfert de nouvelles technologies.

*Conception par le Service aux programmes de recherches.*



# Guide to the Wild Germplasm of Brassica and Allied Crops

## Part III Interspecific and Intergeneric Hybridization in the Tribe Brassiceae (Cruciferae)

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Technical Bulletin 1993-16E

Centre for Land and Biological Resources Research  
Research Branch, Agriculture Canada

November 1993

Copies of this publication are available from:

Centre for Land and Biological Resources Research  
Research Branch, Agriculture Canada  
K.W. Neatby Bldg., C.E.F.  
Ottawa, Ontario  
K1A 0C6

Published by Cartographic Design and Reproduction Unit  
Centre for Land and Biological Resources Research

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Cat. No. A54-8/1993-16E  
ISBN 0-662-21116-2

## INTRODUCTION TO THE GUIDE:

The Cruciferae family, which contains about 3500 species and 350 genera, is one of the ten most economically important plant families (Rich 1991). The tribe Brassiceae is one of the 13-19 tribes which have been recognized within the family and is one of the few tribes believed to constitute a natural group (Hedge 1976, Al-Shehbaz 1984, 1985). It is the most important economically and the most distinctive (Gómez-Campo 1980, Al-Shehbaz 1985). It is distinguished on the basis of the presence of conduplicate cotyledons (i.e. the cotyledons are longitudinally folded around the radical) and/or two-segmented fruits (siliques) which contain seeds in one or both segments, and only simple hairs if present (Gómez-Campo 1980, Al-Shehbaz 1985).

Crop brassicas display enormous diversity and are used as a source of oil, vegetables, mustard condiments, and fodder. Those of particular importance in Canada are: *Brassica napus*, *B. rapa*, and *B. juncea* as sources of canola oil, and *B. oleracea* as cole-crops. The genera *Raphanus* and *Sinapis* are also of major importance, the former cultivated for its edible roots and the latter as a source of mustard condiments along with *B. nigra*. Several species have become naturalized weeds in Canada and the United States [eg. *Sinapis arvensis* (wild mustard), *Raphanus raphanistrum* (wild radish), and *B. rapa* (wild rape)], representing both a potential source of germplasm and agricultural problems. In other areas of the world *Crambe* is cultivated as an industrial oil, and the leaves of other genera (eg. *Eruca* and *Diplotaxis*) are eaten as salad greens.

An understanding of the genetic potential of wild relatives of the crop species of *Brassica* and allied genera (members of the Tribe Brassiceae) is critical for the establishment of long-term breeding programs of these crops. In addition, it is clear that many of the wild species in the tribe have potential value as new crops, as sources of industrial oils (*Crambe*, *Eruca*), condiments (*Sinapis alba*), and other diverse products. Wild relatives also possess a number of useful agronomic traits which could be incorporated into breeding programs, including: cytoplasmic and nuclear male sterility; resistance to disease and insect and nematode pests; intermediate C<sub>3</sub>-C<sub>4</sub> photosynthetic activity; and tolerance of cold, salt and drought conditions.

The last comprehensive taxonomic treatment on the tribe was conducted by Schulz (1919, 1923, 1936). The tribe Brassiceae contains approximately 217 species and 51 genera, 25 of which are monotypic (Table below). Geographically, it is centered in the southwestern Mediterranean region, particularly Algeria, Morocco and Spain, where c. 41 genera are either endemic or exhibit maximum diversity. The tribal range extends eastward into India and Pakistan and southward into South Africa, with a poor representation in the New World (Hedge 1976, Gómez-Campo 1980, Al-Shehbaz 1985).



**GENERA OF THE TRIBE BRASSICEAE (no. species in brackets)**


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Ammosperma (2)	Guiraoa (1)
Boleum (1)	Hemicrambe (2)
Brassica (35)	Henophyton (1)
Cakile (7)	Hirschfeldia (2)
Carrichtera (1)	Kremeriella (1)
Ceratocnemum (1)	Moricandia (9)
Chalcanthus (2)	Morisia (1)
Coincya (6)	Muricaria (1)
Conringia (6)	Otocarpus (1)
Cordylocarpus (1)	Physorrhynchus (2)
Crambe (26)	Pseuderucaria (2)
Crambella (1)	Pseudofortuynia (1)
Didesmus (2)	Psychine (1)
Diplotaxis (27)	Quezeliantha (1)
Dolichorrhynchus (1)	Raffenaldia (2)
Douepia (1)	Raphanus (2)
Enarthrocarpus (5)	Rapistrum (2)
Eremophyton (1)	Rytidocarpus (1)
Eruca (3)	Savignya (1)
Erucaria (9)	Schouwia (1)
Erucastrum (19)	Sinapidendron (5)
Euzomodendron (1)	Sinapis (5)
Fezia (1)	Succowia (1)
Foleyola (1)	Trachystoma (3)
Fortuynia (2)	Vella (5)
	Zilla (1)

---

Within the tribe, Schulz (1919, 1923, 1936) also recognized, somewhat arbitrarily on the basis of morphological characters, seven subtribes: Brassicinae, Cakilinae, Moricandiinae, Raphaninae, Savignyinae, Vellinae, and Zillinae. Gómez-Campo (1980) has since proposed a reduction to six subtribes with the inclusion of the Savignyinae in the Vellinae. The Brassicinae and Moricandiinae both include genera with elongated siliquose dehiscent fruit, while the other subtribes include those with reduced or "nucamentaceous" fruits.

Generic boundaries in the tribe are still somewhat arbitrarily drawn, and the establishment of clear-cut intergeneric relationships requires clarification. Unlike many of the small genera, the species are generally very distinct throughout the family, with fruit characters being the most reliably used structures for the proper identification of genera and species. Taxonomic debate in the tribe has centred most particularly upon the number of and relationships between the subtribes and genera (Hedge 1976, Al-Shehbaz 1985).

The genus *Brassica* is one of ten core genera in the subtribe Brassicinae, which also includes *Coincya*, *Diplotaxis*, *Eruca*, *Erucastrum*, *Hirschfeldia*, *Raphanus*, *Sinapidendron*, *Sinapis*, and *Trachystoma*. The Brassicinae is defined primarily on the basis of elongated (siliquose) dehiscent fruits, presence of median nectaries, and usually seeded beaks. Although morphologically quite distinct from subtribes Cakilinae, Vellinae, and Zillinae, its separation from the Raphaninae and Moricandiinae is less clear. Current generic circumscriptions within the subtribe Brassicinae have also been considered to be highly artificial by many taxonomists, with generic delimitation based primarily on only one or two morphological traits.

Systematists are continuing to re-evaluate relationships within the tribe Brassiceae by way of morphological, cytological, hybridization, isozyme and molecular analyses (studies reviewed in Warwick and Black 1991, 1993). Such research has confirmed many proposed species relationships, but has also indicated new relationships between genera and species. In particular, these studies have identified new potential sources of germplasm for *Brassica* crops, indicating that the range of germplasm important to the genus is much greater than previously recognized.

The following Guide to the wild germplasm of *Brassica* and allied crops (Tribe Brassiceae, family Cruciferae) will be divided into five parts as indicated below:

- I. **Taxonomy and Genome Status** - [Complete list of genera and species in the tribe and their genomic status, containing cross references for commonly confused names];  
by S.I. WARWICK
- II. **Chromosome Numbers**;  
by S.I. WARWICK & J.K. ANDERSON
- III. **Interspecific and Intergeneric Hybridizations**;  
by S.I. WARWICK & L.D. BLACK
- IV. **Wild Species as Sources of Agronomic Traits** - [List of potentially useful agronomic traits and possible wild germplasm sources in the tribe];  
by S.I. WARWICK
- V. **Life History Data** [Summary of habitat and geographical distributions of all species indicated in part I.]  
by S.I. WARWICK

The information provided in this guide is intended to be useful in providing direction for future genebank needs for these crops and for assisting biotechnologists and breeders wishing to utilize these genetic resources in their research programs.

### **PART III: INTERSPECIFIC AND INTERGENERIC HYBRIDIZATION IN THE TRIBE BRASSICEAE (Cruciferae)**

The following publication is the third part of a guide to the wild germplasm of *Brassica* and allied crops (Tribe Brassiceae, family Cruciferae).

Artificial intergeneric hybridizations between various members of the tribe have been carried out on a large scale. TABLE 1 represents a summary of the literature compiled on inter-cytodeme hybridization between members of the tribe Brassiceae and provides an update to the list of Harberd and McArthur (1980). Taxa are arranged alphabetically and correspond to the taxonomic framework indicated in PART I of the guide. Information for each cross is provided on whether the hybrid was obtained sexually, or artificially through culturing of either the ovary, ovules, or the embryo, or through protoplast fusion. Crosses cited in Harberd and McArthur (1980) which were prior to 1970 were usually sexual, whereas those obtained by the latter authors commonly involved embryo rescue techniques. The review by Bajaj (1990) compares ovule, ovary and embryo rescue techniques.

On the basis of chromosome number and crossing ability, Harberd (1976) defined the *Brassica* coenospecies as "the group of wild species sufficiently related to the six cultivated species of *Brassica* to be potentially capable of experimental hybridization with them". TABLE 2 provides a summary of the 45 diploid cytodemes or crossing groups and six amphidiploid taxa described for *Brassica* coenospecies and provides an update to the lists of Harberd (1972, 1976), Harberd & McArthur (1972), Takahata & Hinata (1983). The coenospecies corresponds closely to the taxonomic subtribe Brassicinae, with the inclusion of *Raphanus* and *Enarthrocarpus*. Taxa included within a cytodeme have a single diploid chromosome number, are generally fully interfertile, and essentially cross-sterile with other cytodemes. Inter-cytodeme F<sub>1</sub> hybrids are usually obtained via embryo rescue and tend to exhibit extensive meiotic irregularities. However, the existence of six naturally occurring inter-cytodeme hybrids has been reported.



TABLE 1. Inter-cytodeme hybridization between members of the tribe Brassiceae. Taxa are arranged alphabetically. Each hybrid is listed twice for easy reference, once under each of the maternal and paternal parents. Symbols: D? - the direction of the cross is not known; Rs - the reciprocal cross has been successful; Rt - the reciprocal cross has been tried and not been successful; SEXL - hybrid was obtained sexually; OVAR - hybrid obtained with ovary culture; OVUL - hybrid obtained with ovule culture; EMBR - hybrid obtained with embryo culture; and PROT - hybrid obtained via protoplast fusion.

PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>Brassica adpressa</i> [see <i>Hirschfeldia incana</i> ]		
<i>Brassica alboglabra</i> (n=9)		
<i>B.al.</i> x <i>Brassica rapa</i>	Rs, EMBR	Chen et al. (1988)
<i>Brassica rapa</i> x <i>B.al.</i>	Rs, EMBR	Chen et al. (1988)
<i>B.al.</i> x <i>Moricandia arvensis</i>	SEXL	Apel et al. (1984)
<i>Brassica atlantica</i> (n=9)		
<i>Brassica rapa</i> x <i>B.at.</i>	EMBR	Mithen & Herron (1991)
<i>Brassica balearica</i> (n=16)		
<i>B.ba.</i> x <i>Brassica alboglabra</i>	Rt, SEXL	Snogerup & Persson (1983)
<i>B.ba.</i> x <i>Brassica insularis</i>	Rt, SEXL	Snogerup & Persson (1983)
<i>Brassica barrelieri</i> (n=10)		
<i>Brassica fruticulosa</i> x <i>B.b.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>B.b.</i> x <i>Brassica nigra</i>	D?, S/OVAR	Prakash et al. (1982)
<i>B.b.</i> x <i>Brassica oxyrrhina</i>	Rs, SEXL	Mattsson (1988)
<i>Brassica oxyrrhina</i> x <i>B.b.</i>	Rs, SEXL	Mattsson (1988)
<i>B.b.</i> x <i>Brassica rapa</i>	D?, S/OVAR	Prakash et al. (1982)
<i>Brassica rapa</i> x <i>B.b.</i>	D?, SEXL	Mattsson (1988)
<i>Erucastrum gallicum</i> x <i>B.b.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>B.b.</i> x <i>Sinapis pubescens</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Brassica bourgeauii</i> (n=9)		
<i>Brassica rapa</i> x <i>B.bour.</i>	OVAR	Inomata (1986)
<i>Brassica carinata</i> (n=17)		
<i>B.c.</i> x <i>Brassica fruticulosa</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>B.c.</i> x <i>Brassica juncea</i>	Rs, SEXL	Alam et al. (1992)
<i>Brassica juncea</i> x <i>B.c.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Brassica juncea</i> x <i>B.c.</i>	Rs, SEXL	Alam et al. (1992)
<i>Brassica napus</i> x <i>B.c.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>B.c.</i> x <i>Brassica rapa</i>	Rt, SEXL	Alam et al. (1992)
<i>Brassica rapa</i> x <i>B.c.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Brassica rapa</i> x <i>B.c.</i>	D?, ?	Struss et al. (1992)
<i>Brassica rapa</i> x <i>B.c.</i>	D?, EMBR	Quiros et al. (1985)

PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>B.c.</i> x <i>Diplotaxis assurgens</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>B.c.</i> x <i>Diplotaxis tenuisiliqua</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>B.c.</i> x <i>Diplotaxis virgata</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Enarthrocarpus lyratus</i> x <i>B.c.</i>	Rt, EMBR	Gundimeda et al. (1992)
<i>B.c.</i> x <i>Erucastrum gallicum</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>B.c.</i> x <i>Raphanus sativus</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>B.c.</i> x <i>Sinapis arvensis</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>B.c.</i> x <i>Sinapis pubescens</i>	SEXL	Bing et al. (1991)
	SEXL	Harberd & McArthur (1980)
	SEXL	Bing et al. (1991)
<i>Brassica cretica</i> (n=9)	OVAR	Inomata (1985)
<i>Brassica rapa</i> x <i>B.cr.</i>		
<i>Brassica elongata</i> (n=11)	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis tenuifolia</i> x <i>B.e.</i>		
<i>Brassica fruticulosa</i> (n=8)	Rt, S/EMBR	Harberd & McArthur (1980)
<i>B.f.</i> x <i>Brassica barrellieri</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Brassica carinata</i> x <i>B.f.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>B.f.</i> x <i>Brassica nigra</i>	Rs, S/EMBR	Harberd & McArthur (1980)
	D?, EMBR	Truco & Quiros (1991)
<i>Brassica nigra</i> x <i>B.f.</i>	Rs, S/EMBR	Harberd & McArthur (1980)
	Rt, SEXL	Salisbury (1989), Mattsson (1988)
	D?, S/OVAR	Prakash et al. (1982)
	Rs, S/EMBR	Harberd & McArthur (1980)
	Rs, OVAR	Nanda Kumar et al. (1988a,b)
	EMBR	Nanda Kumar & Shivanna (1990)
<i>Brassica rapa</i> x <i>B.f.</i>	Rs, S/EMBR	Harberd & McArthur (1980)
	Rs, OVAR	Nanda Kumar et al. (1988a,b)
	D?, S/OVAR	Prakash et al. (1982)
<i>B.f.</i> x <i>Brassica spinescens</i>	Rs, EMBR	Truco & Quiros (1991)
<i>Brassica spinescens</i> x <i>B.f.</i>	Rs, EMBR	Truco & Quiros (1991)
<i>Brassica tournefortii</i> x <i>B.f.</i>	D?, S/OVAR	Prakash et al. (1982)
<i>Sinapidendron frutescens</i> x <i>B.f.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Brassica gravinae</i> (n=10)		
<i>Brassica juncea</i> x <i>B.g.</i>	Rt, OVAR	Nanda Kumar et al. (1989)
<i>Brassica napus</i> x <i>B.g.</i>	Rt, OVAR	Nanda Kumar et al. (1989)
<i>Brassica rapa</i> x <i>B.g.</i>	D?, S/OVAR	Prakash et al. (1982)
<i>Brassica hirta</i> [see <i>Sinapis alba</i> ]		
<i>Brassica incana</i> (n=9)		
<i>Brassica oleracea</i> x <i>B.i.</i>		
<i>Brassica rapa</i> x <i>B.i.</i>		
	D?, EMBR	Hu & Quiros (1991)
	EMBR	Mithen & Herron (1991)

PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>Brassica insularis</i> (n=9)		
<i>Brassica balearica</i> x <i>B.is.</i>	Rt,SEXL	Snogerup & Persson (1983)
<i>Brassica oleracea</i> x <i>B.is.</i>	EMBR	Kianian & Quiros (1992a)
<i>Brassica rapa</i> x <i>B.is.</i>	EMBR	Mithen & Herron (1991)
<i>Brassica juncea</i> (n=18)		
<i>B.j.</i> x <i>Brassica carinata</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Brassica carinata</i> x <i>B.j.</i>	Rs,SEXL	Alam et al. (1992)
<i>B.j.</i> x <i>Brassica gravinae</i>	Rs,SEXL	Alam et al. (1992)
<i>B.j.</i> x <i>Brassica napus</i>	Rt,OVAR	Nanda Kumar et al. (1989)
	Rt,S/EMBR	Harberd & McArthur (1980)
	Rs,OVAR	Bajaj (1990)
	Rs,SEXL	Alam et al. (1992), Bing et al. (1991)
<i>Brassica napus</i> x <i>B.j.</i>	Rs,OVAR	Bajaj (1990)
	Rs,SEXL	Alam et al. (1992), Bing et al. (1991)
	PROT	Sundberg & Glimelius (1991)
<i>B.j.</i> x <i>Brassica nigra</i>	Rs,SEXL	Bing et al. (1991)
<i>Brassica nigra</i> x <i>B.j.</i>	Rs,SEXL	Bing et al. (1991)
<i>Brassica oleracea</i> x <i>B.j.</i>	D?, ?	Struss et al. (1992)
<i>B.j.</i> x <i>Brassica rapa</i>	Rs,OVUL	Takeshita et al. (1980)
	Rs,OVAR	Bajaj (1990)
	Rs,OVUL	Takeshita et al. (1980)
<i>Brassica rapa</i> x <i>B.j.</i>	Rs,OVAR	Bajaj (1990)
	PROT	Kirti et al. (1991)
<i>Brassica spinescens</i> x <i>B.j.</i>	D?,OVAR	Yadav et al. (1991)
<i>B.j.</i> x <i>Brassica tournefortii</i>	PROT	Chatterjee et al. (1988)
<i>Diplotaxis muralis</i> x <i>B.j.</i>	Rt,OVAR	Batra et al. (1990)
<i>Diplotaxis siifolia</i> x <i>B.j.</i>	Rt,SEXL	Salisbury (1989)
<i>Diplotaxis tenuifolia</i> x <i>B.j.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>B.j.</i> x <i>Enarthrocarpus lyratus</i>	Rs,EMBR	Gundimeda et al. (1992)
<i>Enarthrocarpus lyratus</i> x <i>B.j.</i>	Rs,EMBR	Gundimeda et al. (1992)
<i>Eruca sativa</i> x <i>B.j.</i>	PROT	Sikdar et al. (1990)
<i>Erucastrum gallicum</i> x <i>B.j.</i>	Rt,EMBR	Batra et al. (1989)
<i>Moricandia arvensis</i> x <i>B.j.</i>	PROT	Kirti et al. (1992a)
<i>B.j.</i> x <i>Raphanus sativus</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Sinapidendron frutescens</i> x <i>B.j.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>B.j.</i> x <i>Sinapis alba</i> (as <i>B. hirta</i> )	Rt,OVAR	Bajaj (1990)
	Rt,EMBR	Mohapatra & Bajaj (1987)
	Rt,S/EMBR	Harberd & McArthur (1980)
<i>B.j.</i> x <i>Sinapis arvensis</i>	Rt,SEXL	Bing et al. (1991)

## PARENTAL COMBINATIONS (♀ x ♂)

## CROSS TYPE REFERENCES

<i>B.j.</i> x <i>Sinapis pubescens</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Trachystoma ballii</i> x <i>B.j.</i>	Rt,OVAR	Inomata (1991)
<i>Brassica macrocarpa</i> (n=9)	PROT	Kirti et al. (1992b)
<i>Brassica rapa</i> x <i>B.m.</i>	EMBR	Mithen & Herron (1991)
<i>Brassica maurorum</i> (n=8)		
<i>B.ma.</i> x <i>Brassica nigra</i>	D?,EMBR	Truco & Quiros (1991)
<i>Brassica nigra</i> x <i>B.ma.</i>	D?,S/OVAR	Prakash et al. (1982)
<i>Brassica rapa</i> x <i>B.ma.</i>	D?,S/OVAR	Prakash et al. (1982)
<i>B.ma.</i> x <i>Sinapis arvensis</i>	D?,EMBR	Truco & Quiros (1991)
<i>Brassica montana</i> (n=9)		
<i>Brassica rapa</i> x <i>B.mo.</i>	OVAR	Inomata (1987)
<i>Brassica napus</i> (n=19)		
<i>B.na.</i> x <i>Brassica carinata</i>	Rt,S/EMBR	Harberd & McArthur (1980)
	Rt,SEXL	Alam et al. (1992)
<i>B.na.</i> x <i>Brassica gravinae</i>	Rt,OVAR	Nanda Kumar et al. (1989)
<i>B.na.</i> x <i>Brassica juncea</i>	Rs,EMBR	Bajaj (1990)
	Rs,SEXL	Alam et al. (1992), Bing et al. (1991)
	PROT	Sundberg & Glimelius (1991)
<i>Brassica juncea</i> x <i>B.na.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
	Rs,EMBR	Bajaj (1990)
	Rs,SEXL	Alam et al. (1992), Bing et al. (1991)
	Rs, ?	Struss et al. (1992)
<i>B.na.</i> x <i>Brassica nigra</i>	Rs,SEXL	Bing et al. (1991)
	Rs,EMBR	Diederichsen & Sacristan (1988)
	Rt,OVAR	Kerlan et al. (1991)
	D? ?	This et al. (1991)
	PROT	Sundberg & Glimelius (1991), Sakhno et al. (1991), Yamagishi et al. (1989)
<i>Brassica nigra</i> x <i>B.na.</i>	Rs, ?	Struss et al. (1992)
	Rs,SEXL	Bing et al. (1991)
	Rs,EMBR	Diederichsen & Sacristan (1988)
<i>B.na.</i> x <i>Brassica oleracea</i>	Rs,OVAR	Kerlan et al. (1991)
	PROT	Sundberg & Glimelius (1991)
<i>Brassica oleracea</i> x <i>B.na.</i>	Rs,OVAR	Kerlan et al. (1991)
<i>B.na.</i> x <i>Brassica rapa</i>	Rs,SEXL	Quiros et al. (1987)
	Rs,EMBR	Bing et al. (1991)
<i>Brassica rapa</i> x <i>B.na.</i>	Rs,SEXL	Quiros et al. (1987)
		Bing et al. (1991)



## PARENTAL COMBINATIONS (♀ x ♂)

## CROSS TYPE REFERENCES

<i>B.na.</i> x <i>Diplotaxis eruroides</i> <i>Diplotaxis eruroides</i> x <i>B.na.</i>	Rt,S/EMBR OVAR SEXL PROT	Harberd & McArthur (1980) Delourme et al. (1989) Ringdahl et al. (1987) Klimaszewska & Keller (1988)
<i>Diplotaxis harra</i> x <i>B.na.</i> <i>Diplotaxis muralis</i> x <i>B.na.</i>	Rt,SEXL SEXL	Salisbury (1989) Ringdahl et al. (1987), Fan et al. (1985)
<i>Diplotaxis siifolia</i> x <i>B.na.</i> <i>Enarthrocarpus lyratus</i> x <i>B.na.</i> <i>B.na.</i> x <i>Eruca sativa</i>	Rt,OVAR Rt,EMBR PROT	Batra et al. (1990) Gundimeda et al. (1992) Sundberg & Glimelius (1991), Fahleson et al. (1988)
<i>Erucastrum gallicum</i> x <i>B.na.</i> <i>B.na.</i> x <i>Hirschfeldia incana</i>	Rt,EMBR Rt,S/EMBR Rs,OVAR Rs,SEXL Rs,OVAR Rs,SEXL Rs,OVAR Rs,OVAR Rt,OVUL PROT	Batra et al. (1989) Harberd & McArthur (1980) Kerlan et al. (1991) Lefol et al. (1991) Kerlan et al. (1991) Lefol et al. (1991) Kerlan et al. (1991) Kerlan et al. (1991) Kerlan et al. (1991) Takeshita et al. (1980) Sundberg & Glimelius (1991), Pelletier et al. (1983), Sakai & Imamura (1990)
<i>Hirschfeldia incana</i> x <i>B.na.</i>	Rt,EMBR PROT	Mathias (1991), Ripley & Arnison (1990) Primard et al. (1988)
<i>B.na.</i> x <i>Raphanus raphanistrum</i> <i>Raphanus raphanistrum</i> x <i>B.na.</i> <i>B.na.</i> x <i>Raphanus sativus</i>	Rt,S/EMBR Rt,OVUL Rt,OVAR OVAR	Harberd & McArthur (1980) Bing et al. (1991) Kerlan et al. (1991) Inomata (1988)
<i>Sinapis alba</i> x <i>B.na.</i> <i>B.na.</i> x <i>Sinapis arvensis</i>	Rt,EMBR PROT Rt,S/EMBR Rt,OVUL Rt,OVAR OVAR	Mathias (1991), Ripley & Arnison (1990) Primard et al. (1988) Harberd & McArthur (1980) Bing et al. (1991) Kerlan et al. (1991) Inomata (1988)
<i>Sinapis arvensis</i> x <i>B.na.</i> <i>B.na.</i> x <i>Sinapis pubescens</i>	Rt,EMBR Rt,S/EMBR Rt,OVAR	Mathias (1991) Harberd & McArthur (1980) Inomata (1991)
<i>Brassica nigra</i> (n=8) <i>Brassica barraelieri</i> x <i>B.ni.</i> <i>B.ni.</i> x <i>Brassica fruticulosa</i>	D?,S/OVAR Rs,S/EMBR Rt,SEXL D?,S/OVAR Rs,S/EMBR D?,EMBR Rs,SEXL Rs,SEXL	Prakash et al. ((1982) Harberd & McArthur (1980) Salisbury (1989), Mattsson (1988) Prakash et al. (1982) Harberd & McArthur (1980) Truco & Quiros (1991) Bing et al. (1991) Bing et al. (1991)
<i>Brassica fruticulosa</i> x <i>B.ni.</i> <i>B.ni.</i> x <i>Brassica juncea</i> <i>Brassica juncea</i> x <i>B.ni.</i>		

## PARENTAL COMBINATIONS (♀ x ♂)

## CROSS TYPE REFERENCES

<i>B.ni.</i> x <i>Brassica mauroorum</i>	D?, S/OVAR	Prakash et al. (1982)
<i>Brassica mauroorum</i> x <i>B.ni.</i>	D?, EMBR	Truco & Quiros (1991)
<i>B.ni.</i> x <i>Brassica napus</i>	Rs, ?	Struss et al. (1992)
	Rs, SEXL	Bing et al. (1991)
	Rs, EMBR	Diederichsen & Sacristan (1988)
	PROT	Yamagishi et al. (1989), Sundberg & Glimelius (1991), Sakhno et al. (1991)
<i>Brassica napus</i> x <i>B.ni.</i>	Rs, ?	Struss et al. (1992)
	Rs, SEXL	Bing et al. (1991)
	Rs, EMBR	Diederichsen & Sacristan (1988)
	Rt, OVAR	Kerlan et al. (1991)
	D?, ?	This et al. (1991)
<i>B.ni.</i> x <i>Brassica oleracea</i>	Rt, S/EMBR	Harberd & McArthur (1980)
	Rs, EMBR	Diederichsen & Sacristan (1988)
	PROT	Sjodin & Glimelius (1989)
<i>Brassica oleracea</i> x <i>B.ni.</i>	Rs, EMBR	Diederichsen & Sacristan (1988)
	D?, EMBR	Quiros et al. (1986b)
	S/OVAR	Prakash et al. (1984)
<i>Brassica oxyrrhina</i> x <i>B.ni.</i>	D?, S/OVAR	Prakash et al. (1982)
<i>Brassica rapa</i> x <i>B.ni.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
	Rt, EMBR	Diederichsen & Sacristan (1988)
	Rt, SEXL	Bing et al. (1991)
	OVAR	Tang & Williams (1988)
<i>B.ni.</i> x <i>Brassica spinescens</i>	D?, SEXL	Mattsson (1988)
<i>Brassica spinescens</i> x <i>B.ni.</i>	D?, S/OVAR	Prakash et al. (1982)
<i>Brassica tournefortii</i> x <i>B.ni.</i>	D?, EMBR	Truco & Quiros (1991)
<i>Coincya monensis</i> x <i>B.ni.</i>	D?, S/OVAR	Prakash et al. (1982)
<i>Diplotaxis erucoides</i> x <i>B.ni.</i>	SEXL	Mattsson (1988)
<i>Diplotaxis tenuifolia</i> x <i>B.ni.</i>	EMBR	Quiros et al. (1988)
<i>B.ni.</i> x <i>Erucastrum virgatum</i>	Rt, SEXL	Salisbury (1989)
<i>B.ni.</i> x <i>Hirschfeldia incana</i>	Rt, S/EMBR	Harberd & McArthur (1980)
	Rt, SEXL	Salisbury (1989)
	Rs, EMBR	Quiros et al. (1988)
	Rs, SEXL	Mattsson (1988)
	Rs, SEXL	Mattsson (1988)
<i>Hirschfeldia incana</i> x <i>B.ni.</i>	OVAR	Takahata & Takeda (1990)
<i>Moricandia arvensis</i> x <i>B.ni.</i>	Rs, OVAR	Matsuzawa & Sarashima (1984)
<i>B.ni.</i> x <i>Raphanus sativus</i>	Rs, OVAR	Matsuzawa & Sarashima (1984)
<i>Raphanus sativus</i> x <i>B.ni.</i>	Rs, OVAR	Matsuzawa & Sarashima (1984)

PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>B.ni.</i> x <i>Sinapis arvensis</i>	Rt,S/EMBR Rs,SEXL Rt,SEXL PROT SEXL Rs,SEXL	Harberd & McArthur (1980) Bing et al. (1991), Mattsson (1988) Salisbury (1989) Toriyama et al. (1987b) Banga & Labana (1991) Bing et al. (1991), Mattsson (1988)
<i>B.ni.</i> x <i>Sinapis arvensis</i> (as <i>S. allionii</i> ) <i>Sinapis arvensis</i> x <i>B.ni.</i> <i>Brassica oleracea</i> (n=9)	D?,EMBR EMBR D?, ? Rs,OVAR Rs,OVAR PROT	Kianian & Quiros (1992a) Kianian & Quiros (1992a) Struss et al. (1992) Kerlan et al. (1991) Kerlan et al. (1991) Sundberg & Glimelius (1991)
<i>B.O.</i> x <i>Brassica incana</i> <i>B.O.</i> x <i>Brassica insularis</i> <i>B.O.</i> x <i>Brassica juncea</i> <i>B.O.</i> x <i>Brassica napus</i> <i>Brassica napus</i> x <i>B.O.</i>	Rs,EMBR D?,EMBR S/OVAR PROT Rt,S/EMBR Rs,EMBR Rt,S/EMBR Rs,OVUL Rt,SEXL Rt,EMBR Rs,SEXL Rs,EMBR PROT	Diederichsen & Sacristan (1988) Quiros et al. (1986b) Prakash et al. (1984) Sjodin & Glimelius (1989) Harberd & McArthur (1980) Diederichsen & Sacristan (1988) Harberd & McArthur (1980) Takeshita et al. (1980) Ellerström (1978) Repkova & Smolíkova (1988) Wojciechowski (1985) Diederichsen & Sacristan (1988) Sundberg & Glimelius (1991) Harberd & McArthur (1980) Takeshita et al. (1980)
<i>Brassica rapa</i> x <i>B.O.</i>	Rt,S/EMBR Rs,OVUL Rt,OVAR D?,SEXL D?,EMBR Rs,SEXL Rs,EMBR SEXL EMBR Rt,S/EMBR D?,S/OVAR D?,SEXL	Inomata (1990), Takeshita et al. (1980) Mattsson (1988) Quiros et al. (1986b) Wojciechowski (1985) Diederichsen & Sacristan (1988) Akbar (1989) Tang & Williams (1988) Harberd & McArthur (1980) Prakash et al. (1982) Mattsson (1988) Harberd & McArthur (1980) Mizushima (1980)
<i>Brassica tournefortii</i> x <i>B.O.</i>		
<i>B.O.</i> x <i>Coincya monensis</i> (as <i>H. cheiranthos</i> ) <i>B.O.</i> x <i>Diplotaxis erucoides</i>	Rt,S/EMBR SEXL	Harberd & McArthur (1980)

PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>B.o.</i> x <i>Diplotaxis muralis</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis tenuifolia</i> x <i>B.o.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Enarthrocarpus lyratus</i> x <i>B.o.</i>	Rt,EMBR	Gundimeda et al. (1992)
<i>Eruca sativa</i> x <i>B.o.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
	OVAR	Matsuzawa & Sarashima (1986)
<i>Erucastrum abyssinicum</i> x <i>B.o.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Erucastrum canariense</i> x <i>B.o.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>B.o.</i> x <i>Hirschfeldia incana</i>	EMBR	Quiros et al. (1986a,1988)
<i>Moricandia arvensis</i> x <i>B.o.</i>	Rt,OVAR	Takahata (1990)
	PROT	Toriyama et al. (1987a)
<i>B.o.</i> x <i>Raphanus sativus</i>	Rs,EMBR	Sarashima et al. (1980)
	PROT	Hagimori et al. (1992), Yamanaka et al. (1992)
<i>Raphanus sativus</i> x <i>B.o.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
	Rs,EMBR	Sarashima et al. (1980)
	Rt,SEXL	Ellerström (1978)
<i>B.o.</i> x <i>Sinapis alba</i>	Rs,S/EMBR	Harberd & McArthur (1980)
<i>Sinapis alba</i> x <i>B.o.</i>	Rs,S/EMBR	Harberd & McArthur (1980)
<i>B.o.</i> x <i>Sinapis arvensis</i>	Rt,S/EMBR	Harberd & McArthur (1980)
	PROT	Toriyama et al. (1987b)
<i>B.o.</i> x <i>Sinapis pubescens</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Brassica oxyrrhina</i> (n=9)		
<i>B.ox.</i> x <i>Brassica barrelieri</i>	Rs,SEXL	Mattsson (1988)
<i>Brassica barrelieri</i> x <i>B.ox.</i>	Rs,SEXL	Mattsson (1988)
<i>B.ox.</i> x <i>Brassica nigra</i>	D?,S/OVAR	Prakash et al. (1982)
<i>B.ox.</i> x <i>B. oleracea</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>B.ox.</i> x <i>Brassica rapa</i>	D?,S/OVAR	Prakash et al. (1982)
	D?,EMBR	Prakash & Chopra (1990)
	D?,SEXL	Mattsson (1988)
	Rs,SEXL	Mattsson (1988)
	Rs,SEXL	Mattsson (1988)
<i>B.ox.</i> x <i>Brassica tournefortii</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Brassica tournefortii</i> x <i>B.ox.</i>		
<i>B.ox.</i> x <i>Sinapis pubescens</i>		
<i>Brassica rapa</i> [= <i>Brassica campestris</i> ] (n=10)		
<i>B.r.</i> x <i>Brassica alboglabra</i>	Rs,EMBR	Chen et al. (1988)
<i>Brassica alboglabra</i> x <i>B.r.</i>	Rs,EMBR	Chen et al. (1988)
<i>B.r.</i> x <i>Brassica atlantica</i>	EMBR	Mithen & Herron (1991)
<i>B.r.</i> x <i>Brassica barrelieri</i>	D?,SEXL	Mattsson (1988)
<i>Brassica barrelieri</i> x <i>B.r.</i>	D?,S/OVAR	Prakash et al. (1982)
<i>B.r.</i> x <i>Brassica bourgeau</i>	OVAR	Inomata (1986)



## PARENTAL COMBINATIONS (♀ x ♂)

## CROSS TYPE

## REFERENCES

<i>Brassica carinata</i> x <i>B.r.</i>	Rt,S/EMBR D?, ?	Harberd & McArthur (1980) Struss et al. (1992)
<i>B.r.</i> x <i>Brassica cretica</i>	OVAR	Inomata (1985)
<i>B.r.</i> x <i>Brassica fruticulosa</i>	Rs,S/EMBR Rs,OVAR	Harberd & McArthur (1980) Nanda Kumar et al. (1988a)
	D?,S/OVAR	Prakash et al. (1982)
<i>Brassica fruticulosa</i> x <i>B.r.</i>	Rs,S/EMBR Rs,OVAR	Harberd & McArthur (1980) Nanda Kumar et al. (1988a)
	D?,S/OVAR	Prakash et al. (1982)
<i>B.r.</i> x <i>Brassica gravinae</i>	EMBR	Mithen & Herron (1991)
<i>B.r.</i> x <i>Brassica incana</i>	EMBR	Mithen & Herron (1991)
<i>B.r.</i> x <i>Brassica insularis</i>	Rs,OVUL	Takeshita et al. (1980)
<i>B.r.</i> x <i>Brassica juncea</i>	Rs,OVAR	Bajaj (1990)
	Rs,OVUL	Takeshita et al. (1980)
<i>Brassica juncea</i> x <i>B.r.</i>	Rs,OVAR	Bajaj (1990)
	EMBR	Mithen & Herron (1991)
<i>B.r.</i> x <i>Brassica macrocarpa</i>	D?,S/OVAR	Prakash et al. (1982)
<i>B.r.</i> x <i>Brassica maurorum</i>	OVAR	Inomata (1987)
<i>B.r.</i> x <i>Brassica montana</i>	Rs,EMBR	Quiros et al. (1987)
<i>B.r.</i> x <i>Brassica napus</i>	Rs,SEXL	Bing et al. (1991)
	Rs,SEXL	Quiros et al. (1987)
<i>Brassica napus</i> x <i>B.r.</i>	Rt,S/EMBR	Bing et al. (1991)
	OVAR	Harberd & McArthur (1980)
<i>Brassica nigra</i>	D?,SEXL	Tang & Williams (1988)
	Rt,EMBR	Mattsson (1988)
	Rt,SEXL	Diederichsen & Sacristan (1988)
<i>B.r.</i> x <i>Brassica oleracea</i>	Rt,S/EMBR SEXL	Bing et al. (1991) Harberd & McArthur (1980)
	EMBR	Akbar (1989), Ellerström (1978)
	Rs,EMBR	Tang & Williams (1988)
	Rs,SEXL	Diederichsen & Sacristan (1988)
	D?,EMBR	Wojciechowski (1985)
	D?,SEXL	Quiros et al. (1986b)
	Rs,OVAR	Mattsson (1988)
	PROT	Takeshita et al. (1980), Inomata (1990) Sundberg & Glimelius (1991)

PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>Brassica oleracea</i> x <i>B.r.</i>	Rs, EMBR Rs, SEXL Rt, SEXL Rt, EMBR D?, S/OVAR D?, S/OVAR Rt, S/EMBR D?, S/OVAR PROT Rt, S/EMBR Rt, SEXL Rt, EMBR Rt, SEXL Rt, EMBR Rt, S/EMBR EMBR OVAR Rt, S/EMBR Rt, S/EMBR Rt, S/EMBR Rs, OVAR Rs, OVAR Rs, S/EMBR OVAR Rs, SEXL PROT Rs, S/EMBR Rs, SEXL Rt, S/EMBR SEXL	Diederichsen & Sacristan (1988) Wojciechowski (1985) Ellerström (1978) Repkova & Smolíkova (1988) Prakash et al. (1982) Prakash & Chopra (1990) Prakash et al. (1982) Harberd & McArthur (1980) Prakash et al. (1982) Hinata & Konno (1979) Harberd & McArthur (1980) Salisbury (1989) Nanda Kumar & Shirvanna (1993) Salisbury (1989) Gundimeda et al. (1992) Harberd & McArthur (1980) Agnihotri et al. (1988) Matsuzawa & Sarashima (1986) Harberd & McArthur (1980) Harberd & McArthur (1980) Harberd & McArthur (1980) Takahata & Takeda (1990) Takahata & Takeda (1990) Harberd & McArthur (1980) Tang & Williams (1988) Ellerström (1978) Pelletier et al. (1983) Harberd & McArthur (1980) Ellerström (1978) Harberd & McArthur (1980) Sobrinho Vesperinas (1988)
<i>Brassica oxyrrhina</i> x <i>B.r.</i>	Rs, EMBR Rs, EMBR PROT D?, EMBR D?, S/OVAR D?, S/OVAR	Truco & Quiros (1991) Truco & Quiros (1991) Kirti et al. (1991) Truco & Quiros (1991) Prakash et al. (1982) Prakash et al. (1982)
<i>B.r.</i> x <i>Brassica spinescens</i>		
<i>Brassica tournefortii</i> x <i>B.r.</i>		
<i>B.r.</i> x <i>Diplotaxis muralis</i>		
<i>Diplotaxis muralis</i> x <i>B.r.</i>		
<i>Diplotaxis siettiana</i> x <i>B.r.</i>		
<i>Diplotaxis tenuifolia</i> x <i>B.r.</i>		
<i>Enarthrocarpus lyratus</i> x <i>B.r.</i>		
<i>B.r.</i> x <i>Eruca sativa</i>		
<i>Eruca sativa</i> x <i>B.r.</i>		
<i>Erucastrium abyssinicum</i> x <i>B.r.</i>		
<i>B.r.</i> x <i>Erucastrium leucanthum</i>		
<i>B.r.</i> x <i>Hirschfeldia incana</i>		
<i>B.r.</i> x <i>Moricandia arvensis</i>		
<i>Moricandia arvensis</i> x <i>B.r.</i>		
<i>B.r.</i> x <i>Raphanus sativus</i>		
<i>Raphanus sativus</i> x <i>B.r.</i>		
<i>B.r.</i> x <i>Sinapis arvensis</i>		
<i>Brassica repanda</i> (n=10)		
<i>Eruca pinnatifida</i> x <i>B.re.</i>		
<i>Brassica spinescens</i> (n=8)		
<i>B.s.</i> x <i>Brassica fruticulosa</i>		
<i>Brassica fruticulosa</i> x <i>B.s.</i>		
<i>B.s.</i> x <i>Brassica juncea</i>		
<i>B.s.</i> x <i>Brassica nigra</i>		
<i>Brassica nigra</i> x <i>B.s.</i>		
<i>Brassica rapa</i> x <i>B.s.</i>		

PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>Brassica tournefortii</i> (n=10)		
B.t. x <i>Brassica fruticulosa</i>	D?, S/OVAR	Prakash et al. (1982)
<i>Brassica juncea</i> x B.t.	D?, OVAR	Yadav et al. (1991)
B.t. x <i>Brassica nigra</i>	D?, S/OVAR	Prakash et al. (1982)
B.t. x <i>Brassica oleracea</i>	Rt, S/EMBR	Harberd & McArthur (1980)
	D?, S/OVAR	Prakash et al. (1982)
	D?, SEXL	Mattsson (1988)
	Rs, SEXL	Mattsson (1988)
B.t. x <i>Brassica oxyrrhina</i>	Rs, SEXL	Mattsson (1988)
<i>Brassica oxyrrhina</i> x B.t.	Rt, S/EMBR	Harberd & McArthur (1980)
B.t. x <i>Brassica rapa</i>	D?, S/OVAR	Prakash et al. (1982)
	Rt, S/EMBR	Harberd & McArthur (1980)
B.t. x <i>Raphanus sativus</i>	Rt, S/EMBR	Harberd & McArthur (1980)
B.t. x <i>Sinapis arvensis</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Coincya</i> [=Hutera = <i>Rhynchosinapis</i> ]		
<i>Coincya monensis</i> (n=12)		
C.m. (as <i>R. cheiranthos</i> ) x <i>Brassica nigra</i>	SEXL	Mattsson (1988)
<i>Brassica oleracea</i> x C.m. (as <i>H. cheiranthos</i> )	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis tenuifolia</i> x C.m. (as <i>H. cheiranthos</i> )	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Coincya rupestris</i> ssp. <i>leptocarpa</i> (n=12)		
<i>Diplotaxis tenuifolia</i> x C.r.l. (as <i>H. leptocarpa</i> )	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis assurgens</i> (n=9)		
<i>Brassica carinata</i> x D.a.	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis tenuisiliqua</i> x D.a.	SEXL	Martínez-Laborde (1988)
D.a. x <i>Diplotaxis virgata</i>	SEXL	Martínez-Laborde (1988)
<i>Diplotaxis brachycarpa</i> (n=9)		
<i>Diplotaxis catholica</i> x D.b. (as <i>D. delagei</i> )	SEXL	Martínez-Laborde (1988)
<i>Diplotaxis catholica</i> (n=9)		
D.c. x D. <i>brachycarpa</i> (as <i>D. delagei</i> )	SEXL	Martínez-Laborde (1988)
<i>Diplotaxis erucoides</i> (n=7)		
D.e. x <i>Brassica napus</i>	OVAR	Delourme et al. (1989)
	SEXL	Ringdahl et al. (1987)
<i>Brassica napus</i> x D.e.	Rt, S/EMBR	Harberd & McArthur (1980)
D.e. x <i>Brassica nigra</i>	EMBR	Quiros et al. (1986a, 1988)
<i>Brassica oleracea</i> x D.e.	D?, SEXL	Mizushima (1980)
<i>Erucastrum gallicum</i> x D.e.	Rt, S/EMBR	Harberd & McArthur (1980)
D.e. x <i>Hirschfeldia incana</i>	Rt, EMBR	Quiros et al. (1988)
	EMBR	Quiros et al. (1986a)
D.e. x <i>Sinapis pubescens</i>	Rt, S/EMBR	Harberd & McArthur (1980)

## PARENTAL COMBINATIONS (♀ x ♂)

## CROSS TYPE REFERENCES

<i>Diplotaxis harra</i> [includes <i>D. crassifolia</i> ] (n=13)	PROT	Klimaszewska & Keller (1988)
<i>D.h.</i> x <i>Brassica napus</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis muralis</i> x <i>D.h.</i> (as <i>D. crassifolia</i> )		
<i>Diplotaxis muralis</i> (n=21)	PROT	Chatterjee et al. 1988
<i>D.m.</i> x <i>Brassica juncea</i>	Rt,SEXL	Salisbury (1989)
<i>D.m.</i> x <i>Brassica napus</i>	SEXL	Ringdahl et al. (1987), Fan et al. (1985)
<i>Brassica oleracea</i> x <i>D.m.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>D.m.</i> x <i>Brassica rapa</i>	Rt,S/EMBR	Harberd & McArthur (1980)
	Rt,SEXL	Salisbury (1989)
<i>D.m.</i> x <i>Diplotaxis harra</i> (as <i>D. crassifolia</i> )	PROT	Hinata & Konno (1979)
<i>Diplotaxis tenuifolia</i> x <i>D.m.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>D.m.</i> x <i>Erucastrum gallicum</i>	SEXL	Sobrino Vesperinas (1988)
<i>D.m.</i> x <i>Sinapidendron frutescens</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis siettiana</i> (n=8)	Rt,S/EMBR	Harberd & McArthur (1980)
<i>D.s.</i> x <i>Brassica rapa</i>	Rt,EMBR	Nanda Kumar & Shivanna (1993)
<i>Diplotaxis siifolia</i> (n=10)	Rt,OVAR	Batra et al. (1990)
<i>D.si.</i> x <i>Brassica juncea</i>	Rt,OVAR	Batra et al. (1990)
<i>D.si.</i> x <i>Brassica napus</i>		
<i>Diplotaxis tenuifolia</i> (n=11)	Rt,S/EMBR	Harberd & McArthur (1980)
<i>D.t.</i> x <i>Brassica elongata</i>	Rt,SEXL	Salisbury (1989)
<i>D.t.</i> x <i>Brassica juncea</i>	Rt,SEXL	Salisbury (1989)
<i>D.t.</i> x <i>Brassica nigra</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>D.t.</i> x <i>Brassica oleracea</i>	Rt,SEXL	Salisbury (1989)
<i>D.t.</i> x <i>Brassica rapa</i>	Rt,SEXL	Salisbury (1989)
<i>D.t.</i> x <i>Colinca rupestris</i> (as <i>H. leptocarpa</i> )	SEXL	Sobrino Vesperinas (1988)
<i>D.t.</i> x <i>Diplotaxis muralis</i>	SEXL	Sobrino Vesperinas (1988)
<i>D.t.</i> x <i>Diplotaxis simplex</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis viminea</i> x <i>D.t.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>D.t.</i> x <i>Erucastrum virgatum</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>D.t.</i> x <i>Hirschfeldia incana</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis tenuisiliqua</i> (n=9)		
<i>Brassica carinata</i> x <i>D.ts.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>D.ts.</i> x <i>Diplotaxis assurgens</i>	SEXL	Harberd & McArthur (1980)
<i>D.ts.</i> x <i>Diplotaxis virgata</i>	SEXL	Martínez-Laborde (1988)
<i>Diplotaxis viminea</i> (n=10)		Martínez-Laborde (1988)
<i>D.v.</i> x <i>Diplotaxis tenuifolia</i>	Rt,S/EMBR	Harberd & McArthur (1980)



PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>Diplotaxis virgata</i> (n=9)		
<i>Brassica carinata</i> x <i>D.vi.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>D.vi.</i> x <i>Brassica juncea</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis assurgens</i> x <i>D.vi.</i>	SEXL	Martínez-Laborde (1988)
<i>Diplotaxis tenuisiliqua</i> x <i>D.vi.</i>	SEXL	Martínez-Laborde (1988)
<i>Enarthrocarpus lyratus</i> (n=10)		
<i>E.l.</i> x <i>Brassica carinata</i>	Rt,EMBR	Gundimeda et al. (1992)
<i>E.l.</i> x <i>Brassica juncea</i>	Rs,EMBR	Gundimeda et al. (1992)
<i>Brassica juncea</i> x <i>E.l.</i>	Rs,EMBR	Gundimeda et al. (1992)
<i>E.l.</i> x <i>Brassica napus</i>	Rt,EMBR	Gundimeda et al. (1992)
<i>E.l.</i> x <i>Brassica oleracea</i>	Rt,EMBR	Gundimeda et al. (1992)
<i>E.l.</i> x <i>Brassica rapa</i>	Rt,EMBR	Gundimeda et al. (1992)
<i>E.l.</i> x <i>Erucastrium abyssinicum</i>		
<i>Erucastrium gallicum</i> x <i>E.l.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Eruca pinnatifida</i> (n=11)	Rt,S/EMBR	Harberd & McArthur (1980)
<i>E.p.</i> x <i>Brassica repanda</i>	SEXL	Sobrino Vesperinas (1988)
<i>Eruca sativa</i> (n=11)		
<i>E.s.</i> x <i>Brassica juncea</i>	PROT	Sikdar et al. (1990)
<i>E.s.</i> x <i>Brassica napus</i>	PROT	Fahleson et al. (1988), Sundberg & Glimelius (1991)
<i>E.s.</i> x <i>Brassica oleracea</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>E.s.</i> x <i>Brassica rapa</i>	OVAR	Matsuzawa & Sarashima (1986)
	EMBR	Agnihotri et al. (1988)
	OVAR	Matsuzawa & Sarashima (1986)
<i>Brassica rapa</i> x <i>E.s.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>E.s.</i> x <i>Raphanus sativus</i>	D?,SEXL	Dayal (1987)
	D?,OVAR	Matsuzawa & Sarashima (1986)
<i>Erucastrium abyssinicum</i> (n=16)		
<i>E.a.</i> x <i>Brassica oleracea</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>E.a.</i> x <i>Brassica rapa</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Enarthrocarpus lyratus</i> x <i>E.a.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>E.a.</i> x <i>Erucastrium leucanthum</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>E.a.</i> x <i>Erucastrium nasturtiifolium</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>E.a.</i> x <i>Erucastrium virgatum</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium canariense</i> (n=9)	Rt,S/EMBR	Harberd & McArthur (1980)
<i>E.c.</i> x <i>Brassica oleracea</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium gallicum</i> (n=15)		
<i>E.g.</i> x <i>Brassica barrelieri</i>	Rt,EMBR	Batra et al. (1989)

PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>Brassica carinata</i> x <i>E.g.</i>	Rt, EMBR	Batra et al. (1989)
<i>E.g.</i> x <i>Brassica juncea</i>	Rt, EMBR	Batra et al. (1989)
<i>E.g.</i> x <i>Brassica napus</i>	Rt, EMBR	Batra et al. (1989)
<i>E.g.</i> x <i>Diplotaxis erucoides</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis muralis</i> x <i>E.g.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>E.g.</i> x <i>Enarthrocarpus lyratus</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>E.g.</i> x <i>Erucastrium nasturtiifolium</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>E.g.</i> x <i>Erucastrium virgatum</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>E.g.</i> x <i>Hirschfeldia incana</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>E.g.</i> x <i>Raphanus sativus</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>E.g.</i> x <i>Sinapidendron frutescens</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>E.g.</i> x <i>Sinapis arvensis</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>E.g.</i> x <i>Sinapis pubescens</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium leucanthum</i> (n=8)	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Brassica rapa</i> x <i>E.l.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium abyssinicum</i> x <i>E.l.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium nasturtiifolium</i> (n=8)	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium abyssinicum</i> x <i>E.n.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium gallicum</i> x <i>E.n.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium virgatum</i> (n=7)	Rt, S/EMBR	Harberd & McArthur (1980)
[includes <i>E. laevigatum</i> n=14]		
<i>Brassica nigra</i> x <i>E.v.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis tenuifolia</i> x <i>E.v.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium abyssinicum</i> x <i>E.v.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium gallicum</i> x <i>E.v.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>E.v.</i> (as <i>E. laevigatum</i> ) x <i>Hirschfeldia incana</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>E.v.</i> x <i>Sinapis pubescens</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Hirschfeldia incana</i> [= <i>Brassica adpressa</i> ] (n=7)	Rt, S/EMBR	Harberd & McArthur (1980)
<i>H.i.</i> x <i>Brassica napus</i>	Rs, OVAR	Kerlan et al. (1991)
	Rs, SEXL	Lefol et al. (1991)
<i>Brassica napus</i> x <i>H.i.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
	Rs, OVAR	Kerlan et al. (1991)
	Rs, SEXL	Lefol et al. (1991)
	Rs, SEXL	Mattsson (1988)
<i>H.i.</i> x <i>Brassica nigra</i>	Rt, EMBR	Quiros et al. (1988)
<i>Brassica nigra</i> x <i>H.i.</i>	Rt, SEXL	Salisbury (1989)
	Rs, SEXL	Mattsson (1988)
<i>Brassica oleracea</i> x <i>H.i.</i>	EMBR	Quiros et al. (1986a, 1988)
<i>Brassica rapa</i> x <i>H.i.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis erucoides</i> x <i>H.i.</i>	Rt, EMBR	Quiros et al. (1986a, 1988)

PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>Diplotaxis tenuifolia</i> x <i>H.i.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Erucastrum gallicum</i> x <i>H.i.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Erucastrum virgatum</i> (as <i>E. laevigatum</i> ) x <i>H.i.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Hutera</i> [see <i>Coincya</i> ]		
<i>Moricandia arvensis</i> (n=14)	SEXL	Apel et al. (1984)
<i>Brassica alboglabra</i> x <i>M.a.</i>	PROT	Kirti et al. (1992a)
<i>M.a.</i> x <i>Brassica juncea</i>	OVAR	Takahata & Takeda (1990)
<i>M.a.</i> x <i>Brassica nigra</i>	Rt,OVAR	Takahata (1990)
<i>M.a.</i> x <i>Brassica oleracea</i>	PROT	Toriyama et al. (1987a)
<i>M.a.</i> x <i>Brassica rapa</i>	Rs,OVAR	Takahata & Takeda (1990)
<i>Brassica rapa</i> x <i>M.a.</i>	Rs,OVAR	Takahata & Takeda (1990)
<i>Raphanus raphanistrum</i> (n=9)	Rs,OVAR	Kerlan et al. (1991)
<i>R.r.</i> x <i>Brassica napus</i>	Rs,OVAR	Kerlan et al. (1991)
<i>Brassica napus</i> x <i>R.r.</i>		
<i>Raphanus sativus</i> (n=9)	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Brassica carinata</i> x <i>R.s.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Brassica juncea</i> x <i>R.s.</i>	PROT	Pelletier et al. (1983), Sakai & Imamura (1990), Sundberg & Glimelius (1991)
<i>R.s.</i> x <i>Brassica napus</i>	Rt,OVUL	Takeshita et al. (1980)
<i>Brassica napus</i> x <i>R.s.</i>	Rs,OVAR	Matsuzawa & Sarashima (1984)
<i>R.s.</i> x <i>Brassica nigra</i>	Rs,OVAR	Matsuzawa & Sarashima (1984)
<i>Brassica nigra</i> x <i>R.s.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>R.s.</i> x <i>Brassica oleracea</i>	Rt,SEXL	Ellerström (1978)
	Rs,EMBR	Sarashima et al. (1980)
	PROT	Hagimora et al. (1992), Yamanaka et al. (1992)
<i>Brassica oleracea</i> x <i>R.s.</i>	Rs,EMBR	Sarashima et al. (1980)
<i>R.s.</i> x <i>Brassica rapa</i>	Rs,S/EMBR	Harberd & McArthur (1980)
	Rs,SEXL	Ellerström (1978)
<i>Brassica rapa</i> x <i>R.s.</i>	PROT	Pelletier et al. (1983)
	Rs,S/EMBR	Harberd & McArthur (1980)
	Rs,SEXL	Ellerström (1978)
	OVAR	Tang & Williams (1988)
<i>Brassica tournefortii</i> x <i>R.s.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Eruca sativa</i> x <i>R.s.</i>	D?,SEXL	Dayal (1987)
	D?,OVAR	Matsuzawa & Sarashima (1986)
<i>Erucastrum gallicum</i> x <i>R.s.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Sinapis arvensis</i> x <i>R.s.</i>	Rt,S/EMBR	Harberd & McArthur (1980)



PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>Rhynchosinapis</i> [see <i>Coincya</i> ]		
<i>Sinapidendron frutescens</i> (n=10)		
<i>S.f.</i> x <i>Brassica fruticulosa</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>S.f.</i> x <i>Brassica juncea</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Diploaxis muralis</i> x <i>S.f.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Erucastrum gallicum</i> x <i>S.f.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>S.f.</i> x <i>Sinapis pubescens</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Sinapis alba</i> [= <i>Brassica hirta</i> ] (n=12)		
<i>Brassica juncea</i> x <i>S.al.</i>	Rt,EMBR	Mohapatra & Bajaj (1987)
<i>Brassica juncea</i> x <i>S.al.</i> (as <i>B. hirta</i> )	Rt,OVAR	Bajaj (1990)
<i>S.al.</i> x <i>Brassica napus</i>	Rt,EMBR	Mathias (1991), Ripley & Arnison (1990)
<i>S.al.</i> x <i>Brassica oleracea</i>	PROT	Primard et al. (1988)
<i>Brassica oleracea</i> x <i>S.al.</i>	Rs,S/EMBR	Harberd & McArthur (1980)
<i>Sinapis allioni</i> [see <i>Sinapis arvensis</i> ]	Rs,S/EMBR	Harberd & McArthur (1980)
<i>Sinapis arvensis</i>		
[includes <i>Sinapis allioni</i> & <i>S. turgida</i> ] (n=9)		
<i>Brassica carinata</i> x <i>S.a.</i>		
<i>Brassica juncea</i> x <i>S.a.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Brassica mauroorum</i> x <i>S.a.</i>	SEXL	Bing et al. (1991)
<i>S.a.</i> x <i>Brassica napus</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Brassica napus</i> x <i>S.a.</i>	Rt,SEXL	Bing et al. (1991)
	D?,EMBR	Truco & Quiros (1991)
	Rt,EMBR	Mathias (1991)
	Rt,S/EMBR	Harberd & McArthur (1980)
	Rt,SEXL	Bing et al. (1991)
	Rt,OVUL	Bing et al. (1991),
	Rt,OVAR	Kerlan et al. (1991)
	OVAR	Inomata (1988)
	Rs,SEXL	Bing et al. (1991)
	SEXL	Mattsson (1988)
<i>S.a.</i> x <i>Brassica nigra</i>	PROT	Toriyama et al. (1987b)
	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Brassica nigra</i> x <i>S.a.</i>	Rs,SEXL	Bing et al. (1991)
	Rt,SEXL	Salisbury (1989)
	SEXL	Banga & Labana (1991)
<i>Brassica nigra</i> x <i>S.a.</i> (as <i>S. allioni</i> )	PROT	Toriyama et al. (1987b)
<i>S.a.</i> (as <i>S. turgida</i> ) x <i>Brassica oleracea</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Brassica oleracea</i> x <i>S.a.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Brassica rapa</i> x <i>S.a.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Brassica tournefortii</i> x <i>S.a.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>Erucastrum gallicum</i> x <i>S.a.</i>	Rt,S/EMBR	Harberd & McArthur (1980)
<i>S.a.</i> x <i>Raphanus sativus</i>	Rt,S/EMBR	Harberd & McArthur (1980)



PARENTAL COMBINATIONS (♀ x ♂)	CROSS TYPE	REFERENCES
<i>Sinapis pubescens</i> (n=9)	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Brassica barrelieri</i> x <i>S.p.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Brassica carinata</i> x <i>S.p.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Brassica juncea</i> x <i>S.p.</i>	Rt, OVAR	Inomata (1991)
<i>Brassica napus</i> x <i>S.p.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
	Rt, OVAR	Inomata (1991)
<i>Brassica oleracea</i> x <i>S.p.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Brassica oxyrrhina</i> x <i>S.p.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Diplotaxis eruroides</i> x <i>S.p.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium gallicum</i> x <i>S.p.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Erucastrium virgatum</i> x <i>S.p.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Sinapidendron frutescens</i> x <i>S.p.</i>	Rt, S/EMBR	Harberd & McArthur (1980)
<i>Sinapis turgida</i> (see <i>Sinapis arvensis</i> )		
<i>Trachystoma ballii</i> (n=8)		
<i>T.b.</i> x <i>Brassica juncea</i>	PROT	Kirti et al. (1992b)

TABLE 2. List of 45 diploid cytodesmes and six amphidiploid taxa described for *Brassica coenospecies*.

n	Cytodeme
1. 10	<i>Brassica barrelieri</i>
2. 7	<i>Brassica deflexa</i>
3. 11	<i>Brassica elongata</i>
4. 8	<i>Brassica fruticulosa</i> (includes <i>B. maurorum</i> , <i>B. spinescens</i> , <i>Erucastrum littoreum</i> ssp. <i>glabrum</i> (= <i>Erucastrum laevigatum</i> ssp. <i>glabrum</i> ) (Gómez-Campo 1981, 1983)
5. 10	<i>Brassica gravinae</i>
6. 8	<i>Brassica nigra</i>
7. 9	<i>Brassica oleracea</i> (includes crop varieties, <i>B. alboglabra</i> , <i>B. bourgeau</i> , <i>B. cretica</i> , <i>B. hilarionis</i> , <i>B. incana</i> , <i>B. insularis</i> , <i>B. macrocarpa</i> , <i>B. montana</i> , <i>B. rupestris</i> , <i>B. villosa</i> ) (Snogerup et al. 1990; Kianian & Quiros 1992b)
8. 9	<i>Brassica oxyrrhina</i>
9. 10	<i>Brassica rapa</i> (includes wild and cultivated varieties)
10. 10	<i>Brassica repanda</i> (includes <i>B. desnottesii</i> , <i>B. nudicaulis</i> , <i>B. saxatilis</i> )
11. 11	<i>Brassica souliei</i> (= <i>B. amplexicaulis</i> )
12. 10	<i>Brassica tournefortii</i>
13. 12	<i>Coincya</i> spp. (includes all species in the genus) (Leadlay & Heywood 1990; Sobrino Vesperinas 1988)
14. 11	<i>Diplotaxis acris</i>
15. 9	<i>Diplotaxis assurgens</i>
16. 9	<i>Diplotaxis berthautii</i>
17. 9	<i>Diplotaxis catholica</i>
18. 7	<i>Diplotaxis cossoniana</i>
19. 7	<i>Diplotaxis eruroides</i>
20. 13	<i>Diplotaxis harra</i> (includes <i>D. crassifolia</i> , <i>D. gracilis</i> , <i>D. hirtum</i> , <i>D. lagascana</i> ) (Gómez-Campo 1981; Sobrino Vesperinas 1985, 1993)
21. 8	<i>Diplotaxis siettiana</i> (includes <i>D. ibicensis</i> )
22. 10	<i>Diplotaxis siifolia</i>
23. 11	<i>Diplotaxis tenuifolia</i> (includes <i>D. cretacea</i> , <i>D. simplex</i> , the latter species was incorrectly listed as <i>D. pitardiana</i> ) (Sobrino Vesperinas 1988)
24. 9	<i>Diplotaxis tenuisiliqua</i>
25. 10	<i>Diplotaxis viminea</i>
26. 9	<i>Diplotaxis virgata</i>
27. 10	<i>Enarthrocarpus</i> ssp. (includes <i>E. lyratus</i> , <i>E. pterocarpus</i> , <i>E. strangulatus</i> )
28. 11	<i>Eruca</i> spp. (includes <i>E. vesicaria</i> , <i>E. sativa</i> , <i>E. pinnatifida</i> )
29. 8	<i>Erucastrum abyssinicum</i>
30. 9	<i>Erucastrum canariense</i> (includes <i>E. cardaminoides</i> )
31. 8	<i>Erucastrum nasturtiifolium</i> (includes <i>E. leucanthum</i> )
32. 8	<i>Erucastrum strigosum</i>
33. 7	<i>Erucastrum varium</i>
34. 7	<i>Erucastrum virgatum</i>
35. 7	<i>Hirschfeldia incana</i>
36. 14	<i>Moricandia arvensis</i> (includes <i>M. nitens</i> , <i>M. spinosa</i> , <i>M. suffruticosa</i> ) (Sobrino Vesperinas 1988)
37. 9	<i>Raphanus</i> ssp. (includes <i>R. raphanistrum</i> , <i>R. sativus</i> , <i>R. caudatus</i> , <i>R. maritimus</i> , <i>R. landra</i> )
38. 10	<i>Sinapidendron</i> spp. (includes <i>S. angustifolium</i> , <i>S. frutescens</i> , <i>S. rupestre</i> )

	<u>n</u>	Cytodeme
39.	12	<i>Sinapis alba</i> (includes <i>S. dissecta</i> )
40.	9	<i>Sinapis arvensis</i> (includes <i>S. allioni</i> , <i>S. turgida</i> )
41.	7	<i>Sinapis aucheri</i> (=Raphanus aucheri)
42.	12	<i>Sinapis flexuosa</i>
43.	9	<i>Sinapis pubescens</i> (includes <i>S. aristidis</i> , <i>S. boivinii</i> , <i>S. indurata</i> )
44.	8	<i>Trachystoma</i> spp. (includes <i>T. aphanoneurum</i> , <i>T. ballii</i> )
45.	8	<i>Trachystoma labasii</i>

**AMPHIDIPLOIDS:** [with proposed parentage in square brackets]

46.	17	<i>Brassica carinata</i> [ <i>B. nigra</i> x <i>B. oleracea</i> ]
47.	18	<i>Brassica juncea</i> [ <i>B. rapa</i> x <i>B. nigra</i> ]
48.	19	<i>Brassica napus</i> [ <i>B. rapa</i> x <i>B. oleracea</i> ]
49.	21	<i>Diplotaxis muralis</i> [ <i>D. tenuifolia</i> x <i>D. viminea</i> ]
50.	15	<i>Erucastrum gallicum</i> [ <i>E. leucanthum</i> x <i>Diplotaxis eruroides</i> / <i>D. cossoniana</i> ]
51.	15	<i>Erucastrum elatum</i> [ <i>E. littoreum</i> x <i>E. virgatum</i> ]

NOTE: n = haploid chromosome number. Allotetraploids (4x) were also indicated for cytodemes 4, 5, 13, 29, 31, 34, 42.





## REFERENCES

- Agnihotri, A., V. Gupta, M.S. Lakshmikumaran, S.A. Ranade, K.R. Shivanna, S. Prakash & V. Jagannathan (1988) Production of *Eruca Brassica* hybrids by embryo rescue and DNA analysis of the hybrids. *Cruciferae Newsletter* 13: 84-85.
- Akbar, M.A. (1989) Resynthesis of *Brassica napus* aiming for improved earliness and carried out by different approaches. *Hereditas* 111: 239-246.
- Alam, M., H. Ahmad, M.H. Quazi & H.I.T. Khawaja (1992) Cross compatability studies within the genus *Brassica* l. Amphidiploid combinations. *Sci. Khyber* 5: 89-92.
- Al-Shehbaz, I.A. (1984) The tribes of Cruciferae (Brassicaceae) in the southeastern United States. *J. Arnold Arboretum* 65: 343-373.
- Al-Shehbaz, I.A. (1985) The genera of Brassiceae (Cruciferae: Brassicaceae) in the southeastern United States. *J. Arnold Arboretum* 66: 279-351.
- Apel, P., H. Bauwe & H. Ohle (1984) Hybrids between *Brassica alboglabra* and *Moricandia arvensis* and their photosynthetic properties. *Biochem. Physiol. Pflanzen*. 179: 793-797.
- Bajaj, Y.P.S. (1990) Wide hybridization in legumes and oilseed crops through embryo, ovule and ovary culture. In: *Biotechnology in agriculture and forestry* 10. Legumes and oilseed crops I. Edited by Y.P.S. Bajaj. Springer-Verlag, Berlin. pp: 3-37.
- Banga, S.S. & K.S. Labana (1991) Cytoplasmic-genetic relationship between *Brassica nigra* and *Sinapis allioni*. *Cruciferae Newsletter* 14/15: 12-13.
- Batra, V., S. Prakash & K.R. Shivanna (1990) Intergeneric hybridization between *Diplotaxis siifolia*, a wild species and crop brassicas. *Theor. Appl. Genet.* 80: 537-541.
- Batra, V., K.R. Shivanna & S. Prakash (1989) Hybrids of wild species *Erucastrum gallicum* and crop brassicas. *Proc. 6th Internatl. Congr. SABRAO* 1 pp: 443-446.
- Bing, D.J., R.K. Downey & G.F.W. Rakow (1991) Potential of gene transfer among oilseed *Brassica* and their weedy relatives. *GCIRC 1991 Congress*: 1022-1027.
- Chatterjee, G., S.R. Sikdar, S. Das & S.K. Sen (1988) Intergeneric somatic hybrid production through protoplast fusion between *Brassica juncea* and *Diplotaxis muralis*. *Theor. Appl. Genet.* 76: 915-922.
- Chen, B.Y., W.K. Heneen & R. Jönsson (1988) Resynthesis of *Brassica napus* L. through interspecific hybridization between *B. alboglabra* Bailey and *B. campestris* L. with special emphasis on seed colour. *Plant Breeding* 101: 52-59.
- Dayal, N. (1987) Towards synthesis of x *Raphanoeruca*. *Cruciferae Newsletter* 12: 7.
- Delourme, R., F. Eber & A.M. Chèvre (1989) Intergeneric hybridization of *Diplotaxis erucoides* with *Brassica napus*. I. Cytogenetic analysis of F<sub>1</sub> and BC<sub>1</sub> progeny. *Euphytica* 41: 123-128.
- Diederichsen, E. & M.D. Sacristan (1988) Interspecific hybridizations in the genus *Brassica* followed by in ovule embryo culture. *Cruciferae Newsletter* 13: 20-21.

- Ellerström, S. (1978) Species crosses and sterility in *Brassica* and *Raphanus*. *Cruciferae Newsletter* 3: 16-17.
- Fahleson, J., L. Råhlén & K. Glimelius (1988) Analysis of plants regenerated from protoplast fusions between *Brassica napus* and *Eruca sativa*. *Theor. Appl. Genet.* 76: 507-512.
- Fan, Z., W. Tai & B.R. Stefanson (1985) Male sterility in *Brassica napus* L. associated with an extra chromosome. *Can. J. Genet. Cytol.* 27: 467-471.
- Gómez-Campo, C. (1980) Morphology and morphotaxonomy of the Tribe Brassiceae. In: *Brassica crops and wild allies*. Edited by S. Tsunoda, K. Hinata, and C. Gómez-Campo. Japan Science Societies Press, Tokyo. pp 3-31.
- Gómez-Campo, C. (1981) Some recent research on wild members of the Brassiceae. *Cruciferae Newsletter* 6: 8.
- Gómez-Campo, C. (1983) Studies on Cruciferae: X. Concerning some West Mediterranean species of *Erucastrum*. *Anales Jardin Bot. Madrid* 40: 63-72.
- Gundimeda, H.R., S. Prakash & K.R. Shivanna (1992) Intergeneric hybrids between *Enarthrocarpus lyratus*, a wild species, and crop brassicas. *Theor. Appl. Genet.* 83: 655-662.
- Hagimori, M., M. Nagaoka, N. Kato, & H. Yoshikawa (1992) Production and characterization of somatic hybrids between the Japanese radish and cauliflower. *Theor. Appl. Genet.* 84: 819-824.
- Harberd, D.J. (1972) A contribution to the cytotaxonomy of *Brassica* (Cruciferae) and its allies. *Bot. J. Linn. Soc.* 65: 1-23.
- Harberd, D.J. (1976) Cytotaxonomic studies of *Brassica* and related genera. In: *The biology and chemistry of the Cruciferae*. Edited by J.G. Vaughan, A.J. MacLeod, & B.M.G. Jones. Academic Press, London. pp: 47-68.
- Harberd, D.J., & E.D. McArthur (1972) Cytotaxonomy of *Rhynchosinapis* and *Hutera* (Cruciferae- Brassiceae). *Heredity* 28: 254-257.
- Harberd, D.J., & E.D. McArthur (1980) Meiotic analysis of some species and genus hybrids in the Brassiceae. In: *Brassica crops and wild allies*. Edited by S. Tsunoda, K. Hinata, & C. Gómez-Campo. Japan Scientific Societies Press, Tokyo. pp: 65-87.
- Hedge, I.C. (1976) A systematic and geographical survey of the Old World Cruciferae. In: *The biology and chemistry of the Cruciferae*. Edited by J.G. Vaughan, A.J. MacLeod, and B.M.G. Jones. Academic Press, London. pp 1-45.
- Hinata, K. & N. Konno (1979) Studies on a male sterile strain having the *Brassica campestris* nucleus and the *Diplotaxis muralis* cytoplasm I. On the breeding procedure and some characteristic of the male sterile strain. *Jpn. J. Breed.* 29: 305-311.
- Hu. J. & C.F. Quiros (1991) Identification of broccoli and cauliflower cultivars with RAPD markers. *Plant Cell. Reports* 10: 505-511.
- Inomata, N. (1985) Interspecific hybrids between *Brassica campestris* and *B. cretica* by ovary culture *in vitro*. *Cruciferae Newsletter* 10: 92-93.
- Inomata, N. (1986) Interspecific hybrids between *Brassica campestris* and *B. bourgeauii* by ovary culture *in vitro*. *Cruciferae Newsletter* 11: 14-15.
- Inomata, N. (1987) Interspecific hybrids between *Brassica campestris* and *B. montana* by ovary culture *in vitro*. *Cruciferae Newsletter* 12: 8-9.

- Inomata, N. (1988) Intergeneric hybridization between *Brassica napus* and *Sinapis arvensis* and their crossability. *Cruciferae Newsletter* 13: 22-23.
- Inomata, N. (1990) Interspecific hybridization in *Brassica* through ovary culture. In: *Biotechnology in agriculture and forestry* 10. Legumes and oilseed crops I. Edited by Y.P.S. Bajaj. Springer-Verlag, Berlin. pp: 367-384.
- Inomata, N. (1991) Intergeneric hybridization in *Brassica juncea* x *Sinapis pubescens* and *B. napus* x *S. pubescens*, and their cytological studies. *Cruciferae Newsletter* 14-15: 10-11.
- Kerlan, M.C., A.M. Chèvre, F. Eber, J. Botterman & W. de Greef (1991) Risk assessment of gene transfer from transgenic rapeseed to wild species in optimal conditions. *GCIRC 1991 Congress*: 1028-1033.
- Kianian, S.F. & C.F. Quiros (1992a) Generation of a *Brassica oleracea* composite RFLP map: linkage arrangements among various populations and evolutionary implications. *Theor. Appl. Genet.* 84: 544-554.
- Kianian, S.F. & C.F. Quiros (1992b) Trait inheritance, fertility, and genomic relationships of some  $n = 9$  *Brassica* species. *Genet. Resources Crop Evol.* 39: 165-175.
- Kirti, P.B., S. Prakash & V.L. Chopra (1991) Interspecific hybridization between *Brassica juncea* and *B. spinescens* through protoplast fusion. *Plant Cell Reports* 9: 639-642.
- Kirti, P.B., S.B. Narasimhulu, S. Prakash & V.L. Chopra (1992a) Somatic hybridization between *Brassica juncea* and *Moricandia arvensis* by protoplast fusion. *Plant Cell Reports* 11: 318-321.
- Kirti, P.B., S.B. Narasimhulu, S. Prakash & V.L. Chopra (1992b) Production and characterization of intergeneric somatic hybrids of *Trachystoma ballii* and *Brassica juncea*. *Plant Cell Reports* 11: 90-92.
- Klimaszewska, K. & W.A. Keller (1988) Regeneration and characterization of somatic hybrids between *Brassica napus* and *Diplotaxis harra*. *Plant Sci.* 58: 211-222.
- Leadlay, E.A. & V.H. Heywood (1990) The biology and systematics of the genus *Coincya* Porta & Rigo ex. Rouy (*Cruciferae*). *Bot. J. Linn. Soc.* 102: 313-398.
- Lefol, E., V. Danielou, H. Darmency, M.-C. Kerlan, P. Vallee, A.M. Chèvre, M. Renard & X. Reboud (1991) Escape of engineered genes from rapeseed to wild *Brassicaceae*. *Proc. Brighton Crop Protection Conference Weeds-1991* 3: 1049-1056.
- Martínez-Laborde, J.B. (1988) Studies on the hybridization and evolution of *Diplotaxis* DC. (*Cruciferae*, *Brassicaceae*). *Cruciferae Newsletter* 13: 14-15.
- Mathias, R. (1991) Improved embryo rescue technique for intergeneric hybridization between *Sinapis* species and *Brassica napus*. *Cruciferae Newsletter* 14/15: 90-91.
- Matsuzawa, Y. & M. Sarashima (1984) Intergeneric hybrids between *Raphanus sativus* and *Brassica nigra*. *Cruciferae Newsletter* 9: 29.
- Matsuzawa, Y. & M. Sarashima (1986) Intergeneric hybridization of *Eruca*, *Brassica* and *Raphanus*. *Cruciferae Newsletter* 11: 17.
- Mattsson, B. (1988) Interspecific crosses within the genus *Brassica* and some related genera. *Sveriges Utsadesforenings Tidskrift* 98: 187-212.
- Mithen, R.F. & C. Herron (1991) Transfer of disease resistance to oilseed rape from wild *Brassica* species. *GCIRC 1991 Congress*: 244-249.



- Mizushima, U. (1980) Genome analysis in *Brassica* and allied genera. In: *Brassica crops and wild allies, biology and breeding*. Edited by S. Tsunoda, K. Hinata, & C. Gomez-Campo. Japan Scientific Societies Press, Tokyo. pp: 89-106.
- Mohapatra, D. & Y.P.S. Bajaj (1987) Interspecific hybridization in *Brassica juncea* x *Brassica hirta* using embryo rescue. *Euphytica* 36: 321-326.
- Nanda Kumar, P.B.A., S. Prakash & K.R. Shivanna (1988a) Wide hybridization in crop brassicas. In: *Sexual reproduction in higher plants*. Edited by M. Cresti, P. Gori & E. Pacini. Springer, Berlin. pp: 95-100.
- Nanda Kumar, P.B.A., K.R. Shivanna & S. Prakash (1988b) Wide hybridization in *Brassica*: Crossability barriers and studies on the  $F_1$  hybrid and synthetic amphidiploid of *B. fruticulosa* x *B. campestris*. *Sex. Plant. Reprod.* 1: 234-239.
- Nanda Kumar, P.B.A., S. Prakash, & K.R. Shivanna (1989) Wide hybridization in *Brassica*: Studies on interspecific hybrids between cultivated species (*B. napus*, *B. juncea*) and a wild species (*B. gravinae*). *Proc. 6th Int. Congr. SABRAO* 1, pp: 435-438.
- Nanda Kumar, P.B.A. & K.R. Shivanna (1990) Embryo and endosperm development in an interspecific cross *Brassica fruticulosa* x *B. campestris*. *Phytomorphology* 40: 359-363.
- Nanda Kumar, P.B.A. & K.R. Shivanna (1993) Intergeneric hybridization between *Diplotaxis siettiana* and crop brassicas for the production of alloplasmic lines. *Theor. Appl. Genet.* 85: 770-776.
- Pelletier, G., C. Primard, F. Vedel, P. Chetrit, R. Remy, P. Rousselle and M. Renard (1983) Intergeneric cytoplasmic hybridization in Cruciferae by protoplast fusion. *Mol. Gen. Genet.* 191: 244-250.
- Prakash, S. & V.L. Chopra (1990) Male sterility caused by cytoplasm of *Brassica oxyrrhina* in *B. campestris* and *B. juncea*. *Theor. Appl. Genet.* 79: 285-287.
- Prakash, S., S. Gupta, R.N. Raut & A.K. Kalra (1984) Synthetic *Brassica carinata*- a preliminary report. *Cruciferae Newsletter* 9: 36.
- Prakash, S., S. Tsunoda, R.N. Raut & S. Gupta (1982) Interspecific hybridization involving wild and cultivated genomes in the genus *Brassica*. *Cruciferae Newsletter* 7: 28-29.
- Primard, C., F. Vedel, C. Mathieu, G. Pelletier & A.M. Chèvre (1988) Interspecific somatic hybridization between *Brassica napus* and *Brassica hirta* (*Sinapis alba* L.). *Theor. Appl. Genet.* 75: 546-552.
- Quiros, C.F., O. Ochoa, & D.S. Douches (1988) Exploring the role of  $x=7$  species in *Brassica* evolution: hybridization with *B. nigra* and *B. oleracea*. *J. Hered.* 79: 351-358.
- Quiros, C.F., S.F. Kianian, O. Ochoa & D. Douches (1985) Genome evolution in *Brassica*: use of molecular markers and cytogenetic stocks. *Cruciferae Newsletter* 10: 21-23.
- Quiros, C.F., O. Ochoa & S.F. Kianian (1986a) Hybridization of two cultivated *Brassica* species with wild relatives of  $x=7$  chromosomes. *Cruciferae Newsletter* 11: 16.
- Quiros, C.F., O. Ochoa, S.F. Kianian & D. Douches (1986b) Evolutionary trends in *Brassica*: gathering evidence from chromosome addition lines. *Cruciferae Newsletter* 11: 22-23.



- Quiros, C.F., O. Ochoa, S.F. Kianian & D. Douches (1987) Analysis of the *Brassica oleracea* genome by the generation of *B. campestris-oleracea* chromosome addition lines: characterization by isozymes and rDNA genes. *Theor. Appl. Genet.* 74: 758-766.
- Řepkova, J. & M. Smolíková (1988) Production of F<sub>1</sub> interspecific hybrids between *Brassica oleracea* and *B. campestris* through *in vitro* embryo rescue. *Cruciferae Newsletter* 13: 86-87.
- Rich, T.C.G. (1991) *Crucifers of Great Britain and Ireland*. Botanical Society of the British Isles, London. 336 pp.
- Ringdahl, E. A., P.B.E. McVetty & J.L. Sernyk (1987) Intergeneric hybridization of *Diplotaxis ssp.* with *Brassica napus*: a source of new CMS systems? *Can. J. Plant Sci.* 67: 239-243.
- Ripley, V.L. & P.G. Arnison (1990) Hybridization of *Sinapis alba* and *Brassica napus* L. via embryo rescue. *Plant Breeding* 104: 26-33.
- Sakai, T. & J. Imamura (1990) Intergenetic transfer of cytoplasmic male sterility between *Raphanus sativus* (cms line) and *Brassica napus* through cytoplasm-protoplast fusion. *Theor. Appl. Genet.* 80: 421-427.
- Sakhno, L.A., N.N. Cherep, M.V. Skarzhinskaya & Y. Gleba (1991) Somatic hybridization in the genus *Brassica* obtaining hybrids between rapeseed *Brassica napus* L. and black mustard *Brassica nigra* L. *Biopolim Kletka* 7: 62-65.
- Salisbury, P. (1989) Potential utilization of wild crucifer germplasm in oilseed *Brassica* breeding. *Proc. ARAB 7th Workshop*, Toowoomba, Queensland, Australia. pp: 51-53.
- Sarashima, M., Y. Matsuzawa & T. Kimura (1980) Intergeneric hybridization between *Brassica oleracea* (♀) and *Raphanus sativus* (♂) by embryo culture. *Cruciferae Newsletter* 5: 25.
- Schulz, O.E. (1919) IV. 105 Cruciferae-Brassicaceae. Part 1. Subtribes Brassicinae and Raphaninae. *In: Das Pflanzenreich*. Edited by A. Engler, Heft 68-70, Wilhelm Engelmann, Leipzig. pp: 1-290.
- Schulz, O.E. (1923) IV. 105. Cruciferae-Brassicaceae. Part II. Subtribes Cakilinae, Zillinae, Vellinae, Savignyinae and Moricandiinae. *In: Das Pflanzenreich*. Edited by A. Engler, Heft 82-85, Wilhelm Engelmann, Leipzig. pp: 1-100.
- Schulz, O.E. (1936) *In: Die Natürlichen Pflanzenfamilien*, 2nd Ed., Edited by A. Engler & K. Prantl, Band 17-b, Wilhelm Engelmann, Leipzig. pp: 227-658.
- Sikdar, S.R., G. Chatterjee, S. Das & S.K. Sen (1990) "Erussica", the intergeneric fertile somatic hybrid developed through protoplast fusion between *Eruca sativa* Lam. and *Brassica juncea* (L.) Czern. *Theor. Appl. Genet.* 79: 561-567.
- Sjödin, C. & K. Glimelius (1989) *Brassica naponigra*, a somatic hybrid resistant to *Phoma lingam*. *Theor. Appl. Genet.* 77: 651-656.
- Snogerup, S. & D. Persson (1983) Hybridization between *Brassica insularis* Moris and *B. balearica* Pers.. *Hereditas* 99: 187-190.
- Snogerup, S., M. Gustafsson & R. Von Bothmer (1990) *Brassica* sect. *Brassica* (Brassicaceae). I. Taxonomy and variation. *Willdenowia* 19: 271-365.
- Sobrinho Vesperinas, E. (1985) Some experimental hybrids on *Diplotaxis harra* (Forsk.) Boiss. complex. *Cruciferae Newsletter* 10: 24-25.

- Sobrinho Vesperinas, E. (1988) Obtainment of some new intergeneric hybrids between wild Brassiceae. *Candollea* 43: 499-504.
- Sobrinho Vesperinas, E. (1993) Taxonomic revision of two endemic species of the genus *Diplotaxis* from Capo Verde Islands. *Candollea* 48: 137-144.
- Struss, D., C.F. Quiros & G. Röbbelen (1992) Mapping of molecular markers on *Brassica* B-genome chromosomes added to *Brassica napus*. *Plant Breeding* 108: 320-323.
- Sundberg, E. & K. Glimelius (1991) Effects of parental ploidy level and genetic divergence on chromosome elimination and chloroplast segregation in somatic hybrids within Brassicaceae. *Theor. Appl. Genet.* 83: 81-88.
- Takahata, Y. (1990) Production of intergeneric hybrids between a  $C_3$ - $C_4$  intermediate species *Moricandia arvensis* and a  $C_3$  species *Brassica oleracea* through ovary culture. *Euphytica* 46: 259-264.
- Takahata, Y., & K. Hinata (1983) Studies on cytodemes in subtribe Brassicinae (Cruciferae). *Tohoku J. Agr. Res.* 33: 111-124.
- Takahata, Y. & T. Takeda (1990) Intergeneric (intersubtribe) hybridization between *Moricandia arvensis* and *Brassica* A and B genome species by ovary culture. *Theor. Appl. Genet.* 80: 38-42.
- Takeshita, M., M. Kato & S. Tokumasu (1980) Application of ovule culture to the production of intergeneric hybrids in *Brassica* and *Raphanus*. *Japanese J. Genet.* 55: 373-387.
- Tang, K. & P.H. Williams (1988) A comparison of ovary, ovule and embryo culture in producing hybrids from wide crosses among rapid cycling *Brassica* species and *Raphanus*. *Cruciferae Newsletter* 13: 82-83.
- This, P., A.M. Chèvre, C.F. Quiros & M. Delseny (1991) RFLP characterization of *Brassica napus*-*Brassica nigra* addition lines. *GCIRC 1991 Congress*: 1050-1054.
- Toriyama, K., K. Hinata & T. Kameya (1987a) Production of somatic hybrid plants, '*Brassicamorica*', through protoplast fusion between *Moricandia arvensis* and *Brassica oleracea*. *Plant Sci.* 48: 123-128.
- Toriyama, K., T. Kameya & K. Hinata (1987b) Selection of a universal hybridizer in *Sinapis turgida* Del. and regeneration of plantlets from somatic hybrids with *Brassica* species. *Planta* 170: 308-313.
- Truco, M.J. & C.F. Quiros (1991) Evolutionary study on *Brassica nigra* and related species. *GCIRC 1991 Congress*: 318-323.
- Warwick, S.I. & L.D. Black (1991) Molecular systematics of *Brassica* and allied genera (Subtribe Brassicinae, Brassiceae) - chloroplast genome and cytodeme congruence. *Theor. Appl. Genet.* 82: 81-92.
- Warwick, S.I. & L.D. Black (1993) Molecular relationships in subtribe Brassicinae (Cruciferae, tribe Brassiceae). *Can. J. Bot.* 71: 906-918.
- Wojciechowski, A. (1985) Interspecific hybrids between *Brassica campestris* L. and *B. oleracea* L. 1. Effectiveness of crossing, pollen tube growth, embryogenesis. *Genetica Polonica* 26: 423-436.

Yadav, R.C., P.K. Sareen & J.B. Chowdhury (1991) Interspecific hybridization in *Brassica juncea* x *Brassica tournefortii* using ovary culture. *Cruciferae Newsletter* 14/15: 84.

Yamagishi, H., M. Hirai, H. Yoshikawa, & S. Yui (1989) Production of somatic hybrid between black mustard (*Brassica nigra* Koch.; BB) and Hakuran (*B. napus* L.; AACC). *Jpn. J. Breed.* 39: 229-233.

Yamanaka, H., Y. Kuginuki, T. Kanno, & T. Nishio (1992) Efficient production of somatic hybrids between *Raphanus sativus* and *Brassica oleracea*. *Jpn. J. Breed.* 42: 329-339.

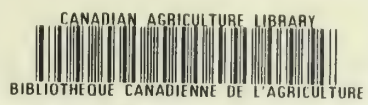
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